NOAA TECHNICAL MEMORANDUM
NMFS-SEFSC-301

BIOLOGICAL REVIEW OF THE 1991 TEXAS CLOSURE

BY

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FEBRUARY 1992

NOTICE:

This report should be cited as follows:

Nance, James M., Edward F. Klima and Frank J. Patella. 1992. Biological Review of the 1991 Texas Closure. NOAA TECHNICAL MEMORANDUM, NMFS-SEFSC-301,18 pp.

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Introduction

In 1981, the Gulf of Mexico Shrimp Fishery Management Plan (FMP) was implemented with the primary objective being to increase the yield of brown shrimp harvested from Texas coastal waters. Since then, various aspects of the Texas closure management measure have been analyzed and reported on by scientists at the Southeast Fisheries Science Center (SEFSC). This report contains an overview of the effects of the 1991 Texas closure and will be presented to the Gulf of Mexico Fishery Management Council in January 1992.

Background

The Shrimp FMP regulates fishing for brown shrimp in the Exclusive Economic Zone (EEZ) off the coast of Texas. This regulation prohibited brown shrimp fishing in the total EEZ (200 mile closure) during the periods: May 22-July 15, 1981; May 26-July 14, 1982; May 27-July 15, 1983; May 16-July 6, 1984; and May 20-July 8, 1985. In 1986, 1987 and 1988, only the portion of the EEZ from 9 to 15 miles was closed to fishing. In 1986, the area was closed from 10 May-July 2, while in both 1987 and 1988, the Texas offshore waters were closed from June l-July 15. In 1989, the 200 mile closure again went into effect, and the entire EEZ was closed to shrimping activities from June l-July 15, 1989. In 1990 the 200 mile closure was from May 15-July 8, 1990, while in 1991 the closure was from May 17-July 6, 1991. State of Texas regulations, implemented in 1960, prohibited shrimp fishing in the territorial sea off Texas during these same periods, except for the white shrimp fishery from the beach to the 4 fathom line. In 1990, however, state law prohibited all shrimping activities including the 4 fathoms daytime fishery. This same law was in effect during the 1991 closure.

The management objectives of the Texas closure regulation (as specified in the FMP) are to increase the yield of brown shrimp and eliminate the waste of the resource caused by discarding undersized shrimp caught during a period in their life cycle when they are growing rapidly. The objective of the 1960-1980 Texas territorial sea closure was to manage the fishery so that a substantial portion ($\geq$50%) of the shrimp in Gulf waters had reached 65 tails/lb or 112 mm in length by the season's opening. Thus, the temporary closure of the offshore fishery

from mid-May to mid-July each year provides larger shrimp to the fishery and subsequently a higher market value.

Methods

Port agents collected statistics on the catch, effort, and fishing location of shrimp vessels operating in the Gulf of Mexico. These data provided information on the species, size and location of shrimp, as well as information on the catch rates and fishing efforts of the vessels in the fleet.

Conclusions

1. Recruitment

Initial estimates of recruitment of brown shrimp to Texas offshore waters in 1991 appeared to be lower than in 1990. We predicted the 1991 annual (June 1991 -May 1992) offshore harvest to be 23.1 ± 9 million pounds, which is below the average (long-term) production of 26.8 million pounds. However, the catch from June-August 1991 was 20.2 million pounds, which projected for the year June 1991 -May 1992 amounts to about 40.4 million pounds.

Rainfall amounts in 1991, as in 1990, were well above the historical average, resulting in low salinities in estuarine marsh habitats in Texas and Louisiana. Unlike last year, however, consistently low salinities occurred during February through early April - the period when we- expect maximum influx of brown shrimp postlarvae into the bays. Salinities remained low for the duration of the critical growing period in the spring as well. Despite higher than average tides along the Gulf coast and warmer than average air temperatures - environmental factors that are expected to produce an expanded and more favorable shrimp nursery habitat - the lower salinities may have confined shrimp to smaller than normal areas, thus reducing food availability and increasing predation. The lower salinities may have also caused the early migration of small shrimp into Gulf waters.

Prospects for Louisiana brown shrimp harvests were higher; our model for waters west of the Mississippi River suggested inshore and offshore catches (May 1991-April 1992) should be about 35.4 ± 12.0 million pounds, which is above the 28.1 million pounds average annual yield for the area. Louisiana Wildlife and Fisheries scientists estimated that 1.0 million acres of prime nursery habitat for brown shrimp were available in 1991. Despite a 0.74 million acre habitat decrease since 1989, environmental conditions were apparently good for shrimp growth and survival. The catch from May-August 1991 was 27.1 million pounds, which projects an annual yield from May 1991-April 1992 of 33.9 million pounds.

Thus, the western Gulf of Mexico should experience a combined annual brown shrimp production level of between 58.5 million pounds (23.1 million + 35.4 million) and 74.3 million pounds (40.4 million + 33.9 million) during the 1991- 1992 season, which is above the 55.0 million pounds average for the area.

2. Fishing Trends

Louisiana

The May through August 1991 catch in Louisiana for inshore waters amounted to only 6.5 million pounds, with 92% of the total catch in May and June. This year’s inshore production was the lowest ever produced during the May through August period (Table 1).

In 1991, May inshore production was 3.1 million pounds with June production at 2.9 million pounds. Catch levels dropped quickly after June, with a July catch of only 172 thousand pounds and an August catch of 366 thousand pounds.

In May 1991, the Louisiana offshore fishery produced only 7.0 million pounds of brown shrimp, with over 18,200 days of fishing effort, for an average CPUE value of only 380 pounds per day. Similar to most years, but unlike 1987, the majority of the catch occurred in the shallow waters of statistical subareas 13-15 (Fig. 1). Very little catch or effort was experienced in either statistical

subarea 16 or 17 during May. CPUE values were high in area 13, low in area 14, and moderate in areas 15-17.

In June; the fishery off Louisiana produced 8.5 million pounds of brown shrimp with a fishing effort of over 16,300 days. The average CPUE value was 523 pounds per day. CPUE values were moderate (500 pounds per day) in most statistical areas (Fig. 2). Unlike most years, production took place further offshore in each of the five statistical subareas (13-17).

In July offshore fishery in statistical subareas 13-17 produced 3.2 million pounds of brown shrimp with an effort of about 4,100 days of fishing (Table 2). Average CPUE was 752 pounds per day. CPUE values were lowest in subareas 13, 15 and 16, and highest in subareas 14 and 17 (Texas subareas not included in this discussion) (Fig. 3). Most of the catch was in water shallower than 15 fm in all statistical subareas.

In August, the Louisiana offshore fishery produced approximately 1.9 million pounds of brown shrimp with an effort value of 3,900 days. Average CPUE was only 496 pounds per day. Catch levels were low in all statistical subareas (Fig. 4).

Thus, during the May-August 1989 period, 20.6 million pounds of brown shrimp were landed from the offshore Louisiana fishery. This catch level is high when compared to most other values since 1981 (Table 1). This catch came from a high expenditure of effort. A total of nearly 42,700 days of fishing occurred during this four month period off Louisiana.

Texas

Thus far in biological year 1991, 7.8 million pounds of brown shrimp have been landed from Texas bays (Table 1). This is the greatest catch ever recorded from Texas inshore waters. Monthly catches during 1991 were greatest in May and June with 3.3 million pounds in May and 3.1 million pounds in June. These two months accounted for 82% of the catch during the four month period. Landings were still quite high in July with 1.2 million pounds landed, but dropped off quickly in August with about 133 thousand pounds landed.

The 1991 offshore production from May through August amounted to 21.3 million pounds with 20.1 million pounds (94%) of the catch produced in the July through August period (Table 1) (Fig. 5). The four month catch total experienced this year was the second largest since the record catch noted in 1981 (25.3 million pounds) (Table 1).

In May 1991, a little over 1.0 million pounds of brown shrimp were landed with an effort of around 2,200 days fished. This produced a CPUE value of 460 pounds per day. Landings were similar in all statistical subareas except 21, which had the highest level. Subarea 19 had the largest CPUE (Fig. 1).

With the entire EEZ closed to shrimp trawling, June production was only 0.2 million pounds. This value is similar to most other June levels during 200 mile closure years, but reduced below catches experienced during 15, mile closure June periods. Effort was only about 236 days fished. This effort value was also similar to most 200 mile closure years for the month of June. Average CPUE was 706 pounds per day. Catch and effort were low in all statistical subareas (18-21) (Fig. 2).

Total catch in July was 12.7 million pounds with only 8,200 days fished. This is an excellent catch for the month of July (Table 1). CPUE during the July period average 1554 pounds per day (Table 2). CPUE was highest in subareas 20 and 21 (Fig. 3). The greatest catch occurred in the 11-15 fm depth off statistical areas 19-21, and in the 16-20 fm depth off area 18 (Fig. 3).

In August, the offshore Texas catch was 7.4 million pounds of brown shrimp with an effort of about 7,600 days of fishing. CPUE was around 971 pounds per day. Catch was high, but effort values were low when compared to other August values. Thus, CPUE was at the high end of the range when compared to other August values (Table 2). As in years past, most production was concentrated in subareas 18 and 19 (Fig. 4), but all subareas off Texas experienced very good CPUE values, with subarea 18 having the best at around 1,100 pounds per day (Fig. 4).

3. Distribution of Catch From Texas Offshore Waters

Some concern has been expressed that the distribution of landings following the Texas closure has changed in recent years. To evaluate this problem the offshore Texas catch following the closure (opening day-August 31), was partitioned by port of landing. Landing locations were summarized into five general groups. These groups included lower Texas ports (Port Mansfield, Aransas County, Riviera, Nueces County, Port Isabel and Brownsville), middle Texas ports (Brazoria County, Matagorda County, Calhoun County, Refugio County, Port Lavaca, Matagorda, Palacios, Port O'Connor and Seadrift), upper Texas ports (Jefferson County, Chambers County, Galveston Island, Harris County and Kemah), Louisiana ports (all Louisiana ports), and other ports (ports from Mississippi, Alabama, Florida and the U.S. east coast).

Analysis of the catch from offshore subarea 18 shows that the upper Texas ports have historically received between 50 and 60% of the landings since about 1984 (Fig. 6). Closures of 200 miles (1981-1985, 1989-1991) or 15 miles (1986-1988) seem to make little difference in this percentage distribution. During the last three years landings in upper ports have been in excess of 2.0 million pounds (Fig. 6). The size of shrimp caught off subarea 18 before and after the closure shows that a combination of large (15-20) and small (>41) shrimp were taken during the May period, but in very small amounts (Fig. 7). Following the closure, brown shrimp were taken in large quantities in most size groups, but the majority were in the 31-40 count range. White shrimp were mostly in the <20 count range following the closure (Fig. 7).

The distribution of catch from all offshore Texas subareas has changed little since 1980 (Fig. 8). Lower Texas ports seem to have the greatest percentage of the landing at around 50%. This is followed by the middle Texas ports (24%) and then the upper Texas ports (13%). This relationship seems to maintain itself during both 15 (1986-1988) and 200 mile closure years (1981-1985, 1989-1991).

4. White Shrimp Catch off Texas

For the second consecutive year the 0-4 fathom white shrimp fishery off Texas has been closed in conjunction with the Texas closure. During July 1990, following the first white shrimp closure, the majority of the white shrimp were in the <15 count range (Fig. 9). This large shrimp trend carried into August 1990, with the majority of the shrimp in the <30 count group. Following the 1991 closure the majority of the shrimp in July were in the <20 count range, with a peak in production that has not been experienced in any other year since 1960. The 1.0 million pounds of white shrimp taken in July off Texas is about 2 times greater than any previous recorded catch. The abundance of shrimp in August 1991 was still good, but production values during 1984, 1986 and 1990 were better (Fig.9). The white shrimp in August 1991 were still quite large, with the majority <25 count.

Table 1. May - August catch of brown shrimp in millions of pounds from Louisiana (13-17) and Texas (18-21).

Area	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
Louisiana											
Inshore	6.5	15.9	11.3	14.0	12.4	14.3	8.9	14.9	12.1	15.1	15.2
Offshore	20.6	24.9	20.5	14.9	20.8	22.8	16.4	13.6	8.8	13.7	23.1
Total	27.1	40.8	31.0	28.9	33.2	37.1	25.7	28.5	20.9	28.8	38.3
Texas											
Inshore	7.8	7.4	6.1	6.9	7.6	5.1	5.4	7.1	5.9	4.1	4.2
Offshore	21.3	20.4	17.3	15.2	17.5	14.0	14.5	16.1	10.7	13.9	25.3
Total	29.1	27.8	23.4	22.1	25.1	19.1	19.9	23.5	16.4	18.0	29.5
Offshore Only											
Louisiana											
May-June	15.5	18.8	13.0	6.6	11.5	13.2	10.9	7.1	3.9	8.6	12.6
Ju!y	3.2	4.5	4.9	4.1	6.0	6.3	3.0	3.8	2.6	3.3	7.5
August	1.9	1.6	2.6	4.2	3.3	3.3	2.5	2.7	2.3	1.8	3.0
Texas											
May-June	1.2	0.8	1.0	2.7	3.3	3.3	0.6	0.8	0.7	0.8	0.4
July	12.7	11.9	7.3	7.5	8.9	5.7	8.3	8.8	5.2	6.6	10.4
August	7.4	7.7	9.0	5.0	5.3	5.0	5.6	6.5	4.8	6.5	14.5

Table 2. Summary of Offshore Fishing Effort and CPUE for Louisiana (13-17) and Texas (18-21).

Fishing Effort (1000 Days)

	Area 13 - 17			Area 18 - 21		
	May - June	July	August	May - June	July	August
1981	14.8	8.1	3.8	1.1	4.4	10.4
1982	14.2	6.4	3.4	2.6	5.2	10.2
1983	9.1	4.2	4.9	2.3	3.7	6.7
1984	9.8	6.4	4.7	2.4	8.2	9.0
1985	11.1	6.0	3.7	1.5	6.8	8.4
1986	15.9	7.5	4.3	6.3	6.3	6.2
1987	19.0	10.0	5.8	7.7	9.8	8.2
1988	18.8	7.5	8.0	7.1	9.6	8.7
1989	28.5	8.2	2.8	3.8	5.7	10.2
1990	25.3	9.3	3.0	2.8	8.3	8.2
1991	34.7	4.1	3.9	2.5	8.2	7.6

CPUE (Pounds per Fishing Day)

	Area 13 - 17			Area 18 - 21		
	May - June	July	August	May - June	July	August
1981	852	927	799	308	2,382	1,408
1982	607	525	522	295	1,279	629
1983	430	415	470	310	1,414	714
1984	718	598	573	295	1,074	723
1984	982	612	682	389	1,223	672
1986	830	840	773	524	896	799
1987	605	595	577	429	905	653
1988	351	556	521	538	781	578
1989	454	603	832	273	1,276	889
1990	749	473	517	298	1,426	937
1991	448	752	496	483	1,554	971

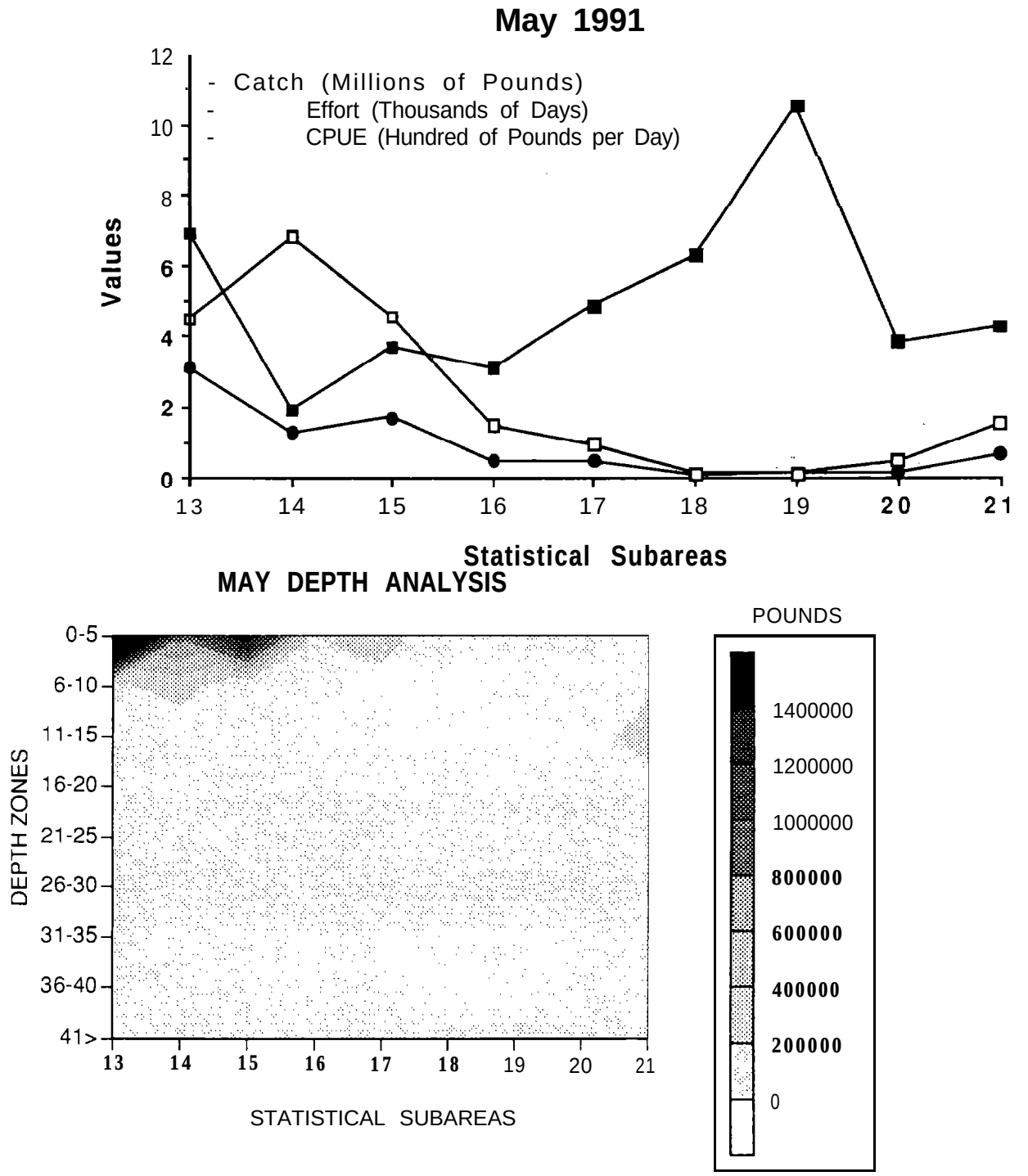
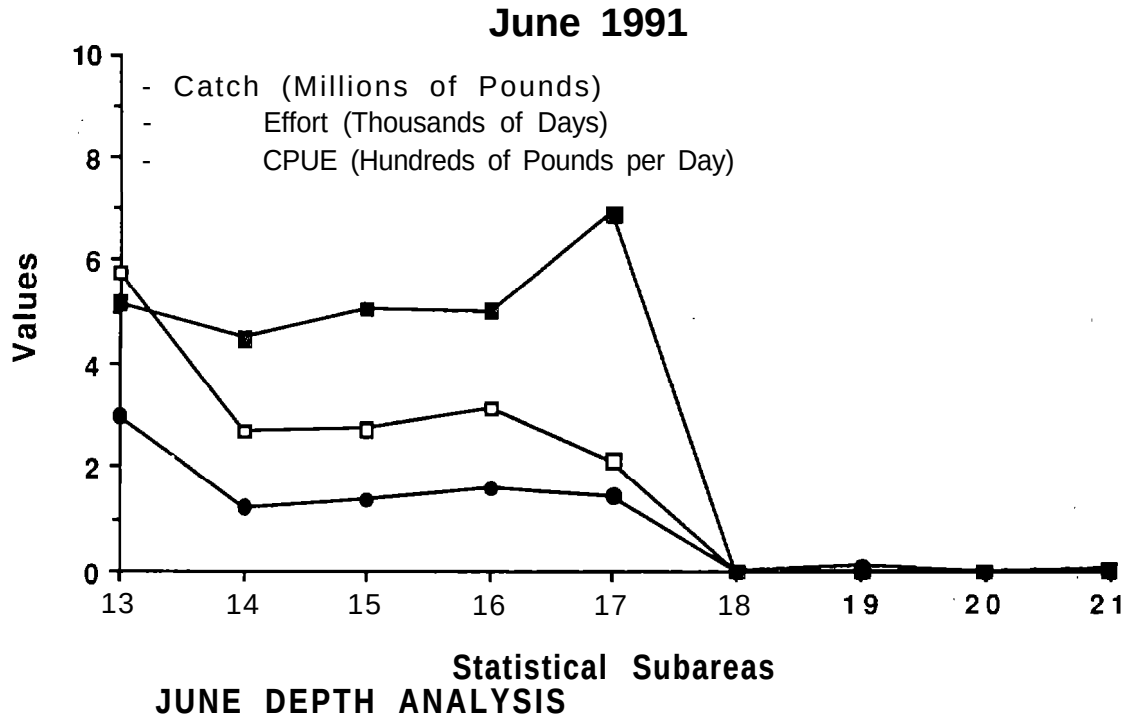


Figure 1. Offshore brown shrimp catch, effort and CPUE values during May 1991.



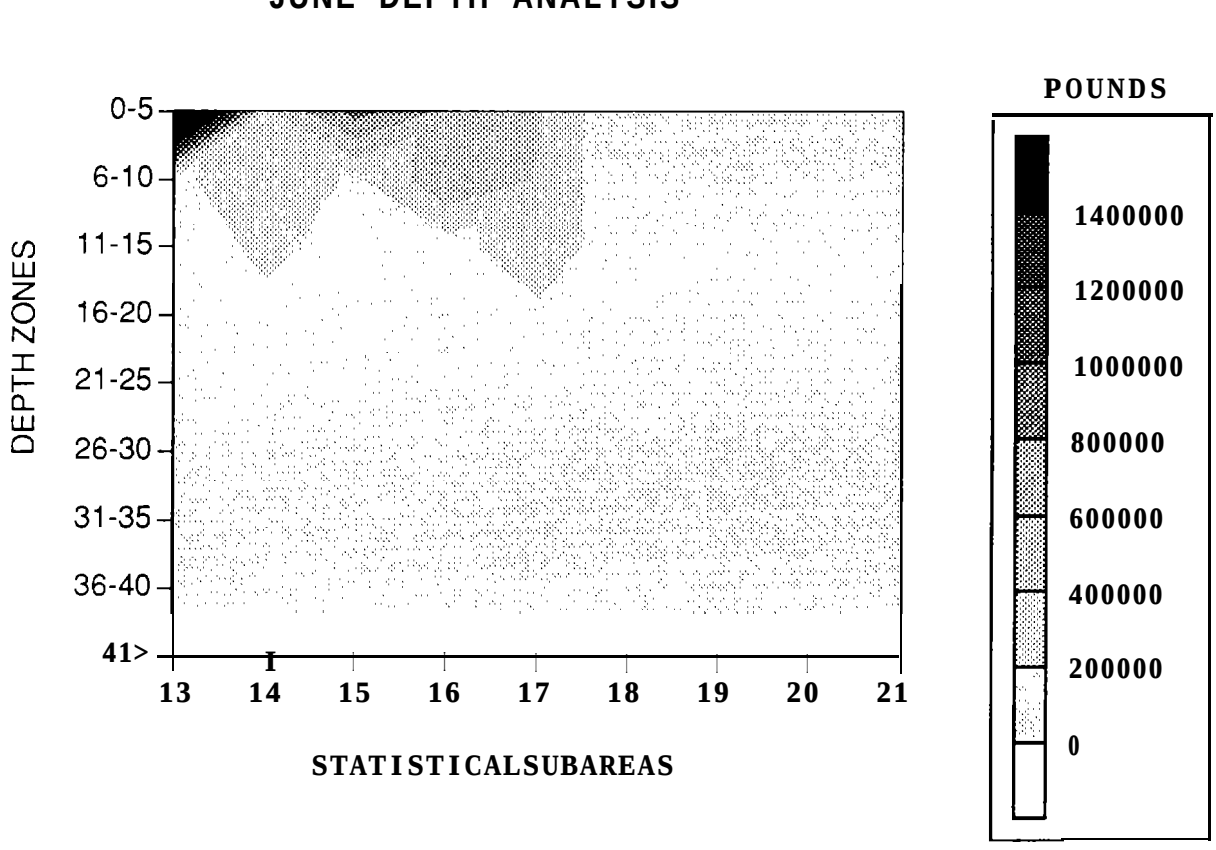


Figure 2. Offshore brown shrimp catch, effort and CPUE values during June 1991.

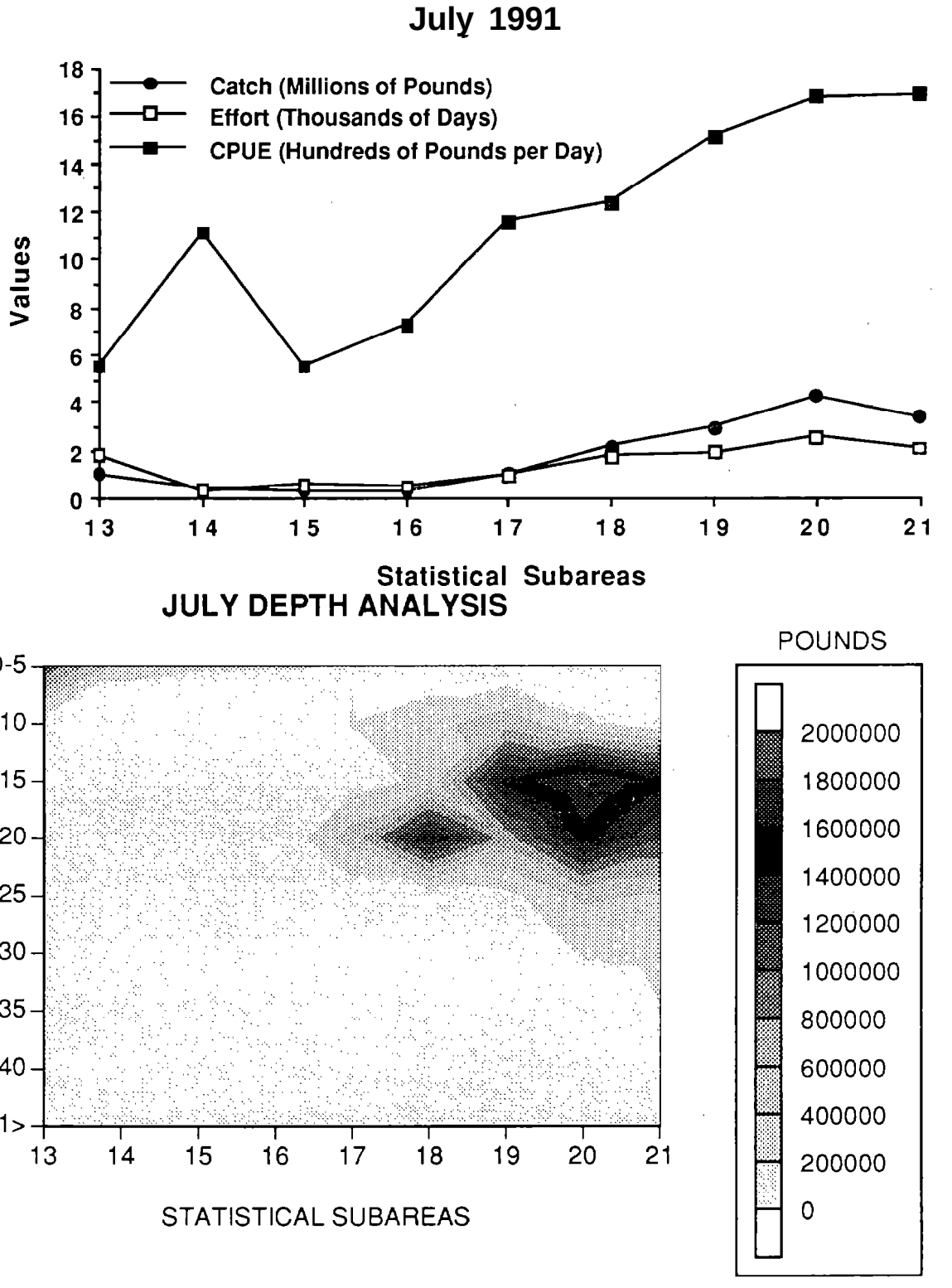


Figure 3. Offshore brown shrimp catch, effort and CPUE values during July 1991.

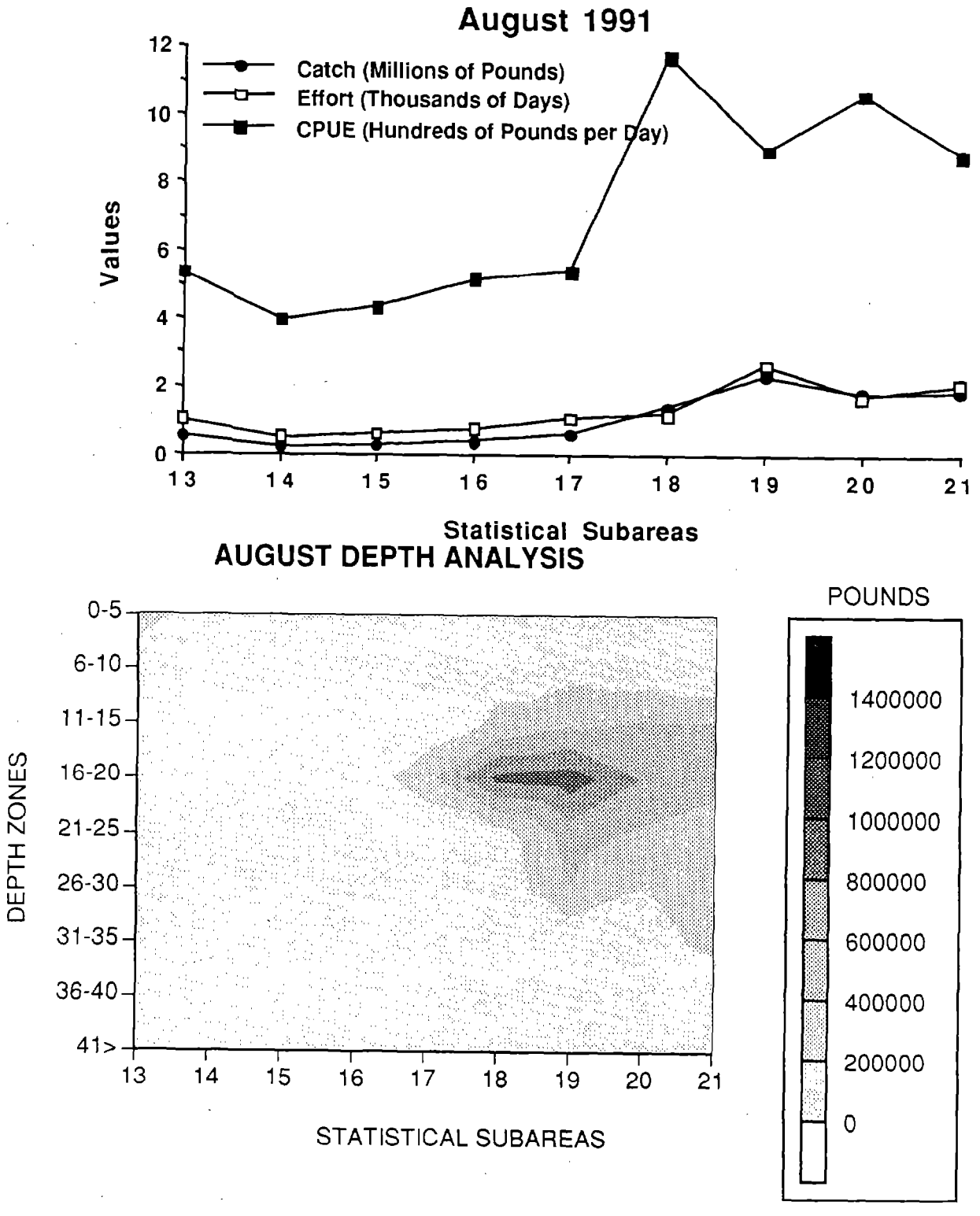


Figure 4. Offshore brown shrimp catch, effort and CPUE values during August 1991.

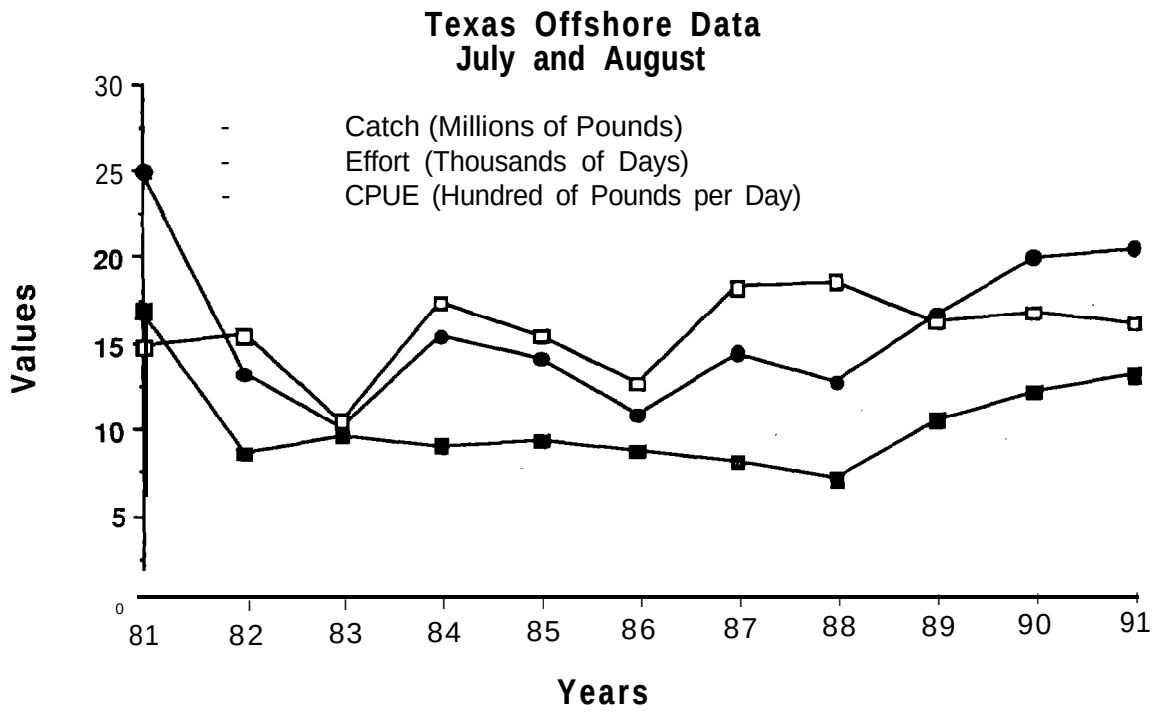


Figure 5. Offshore Texas brown shrimp catch, effort and CPUE values during the July - August 1991 period.

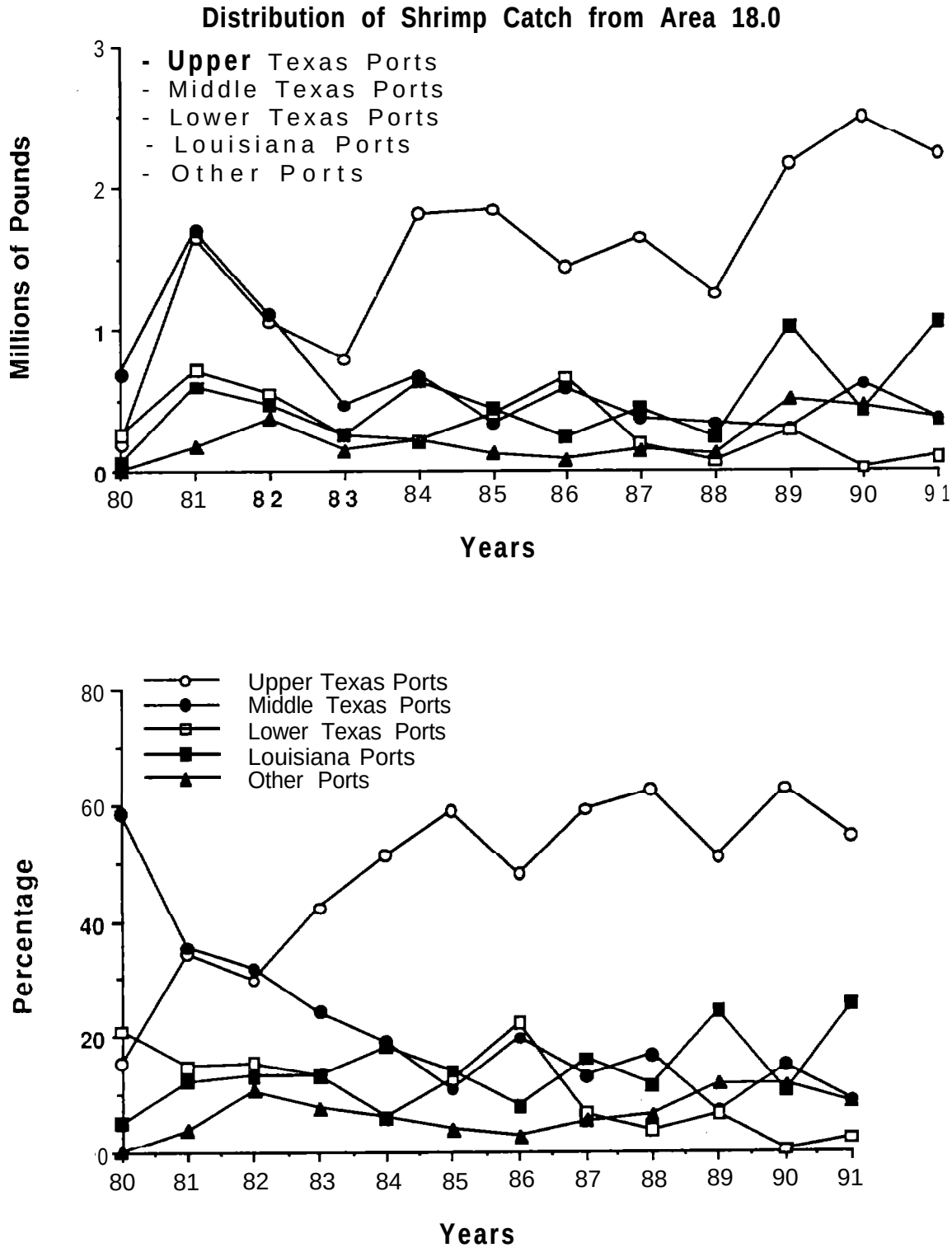


Figure 6. Distribution (actual and percentage) of total shrimp catch from offshore area 18.

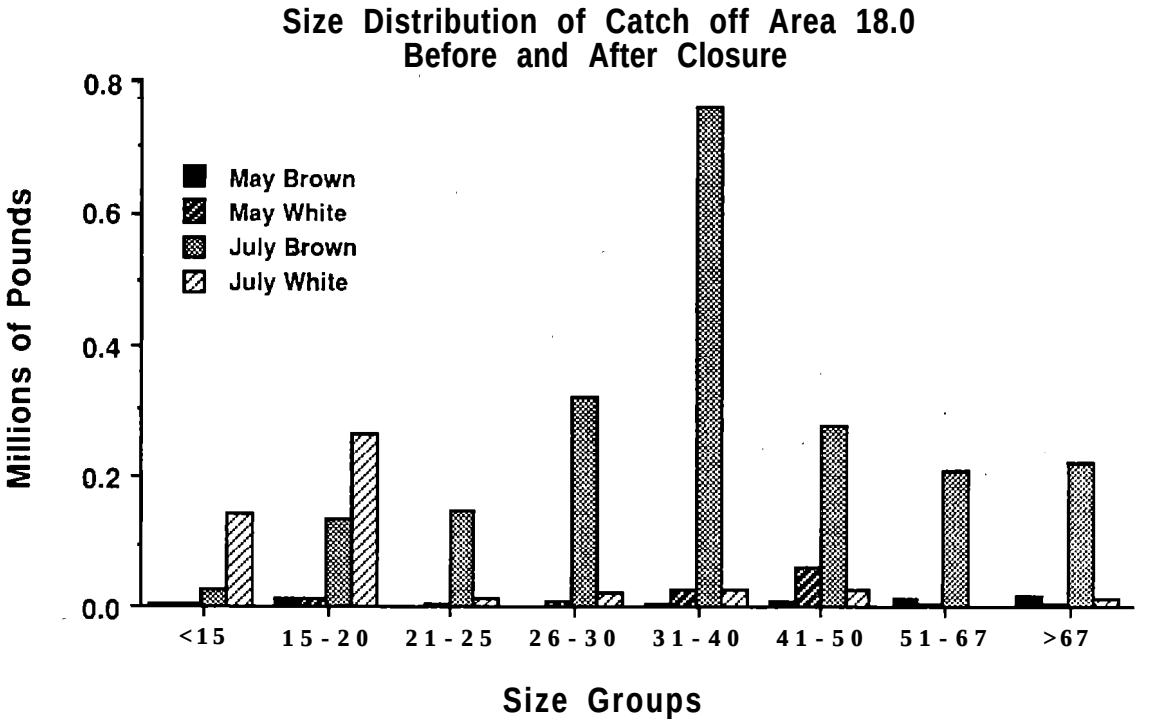


Figure 7. Size distribution of white and brown shrimp off the Texas coast before and after the 1991 Texas closure.

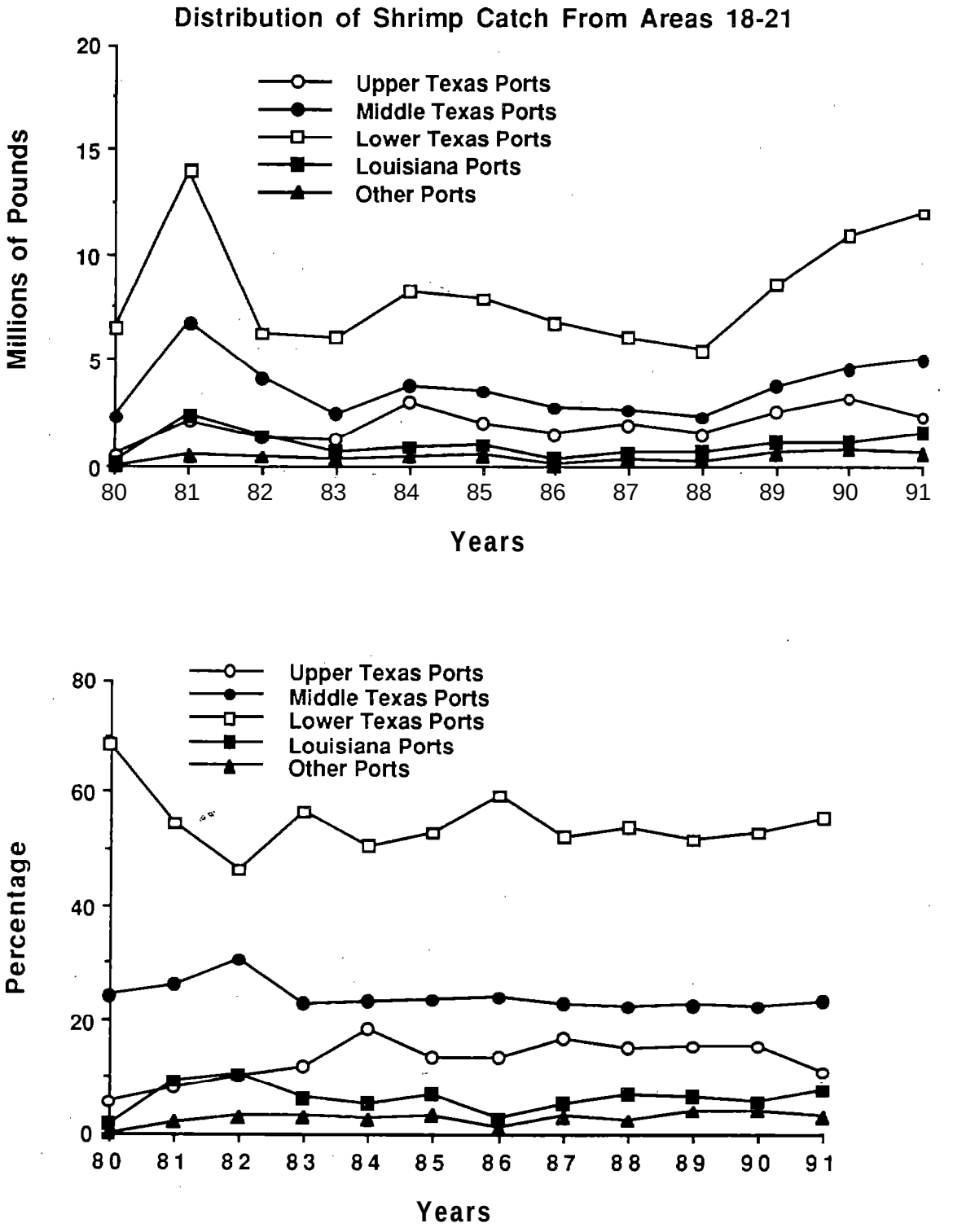


Figure 8. Distribution (actual and percentage) of total shrimp catch from all Texas offshore areas (18-21).

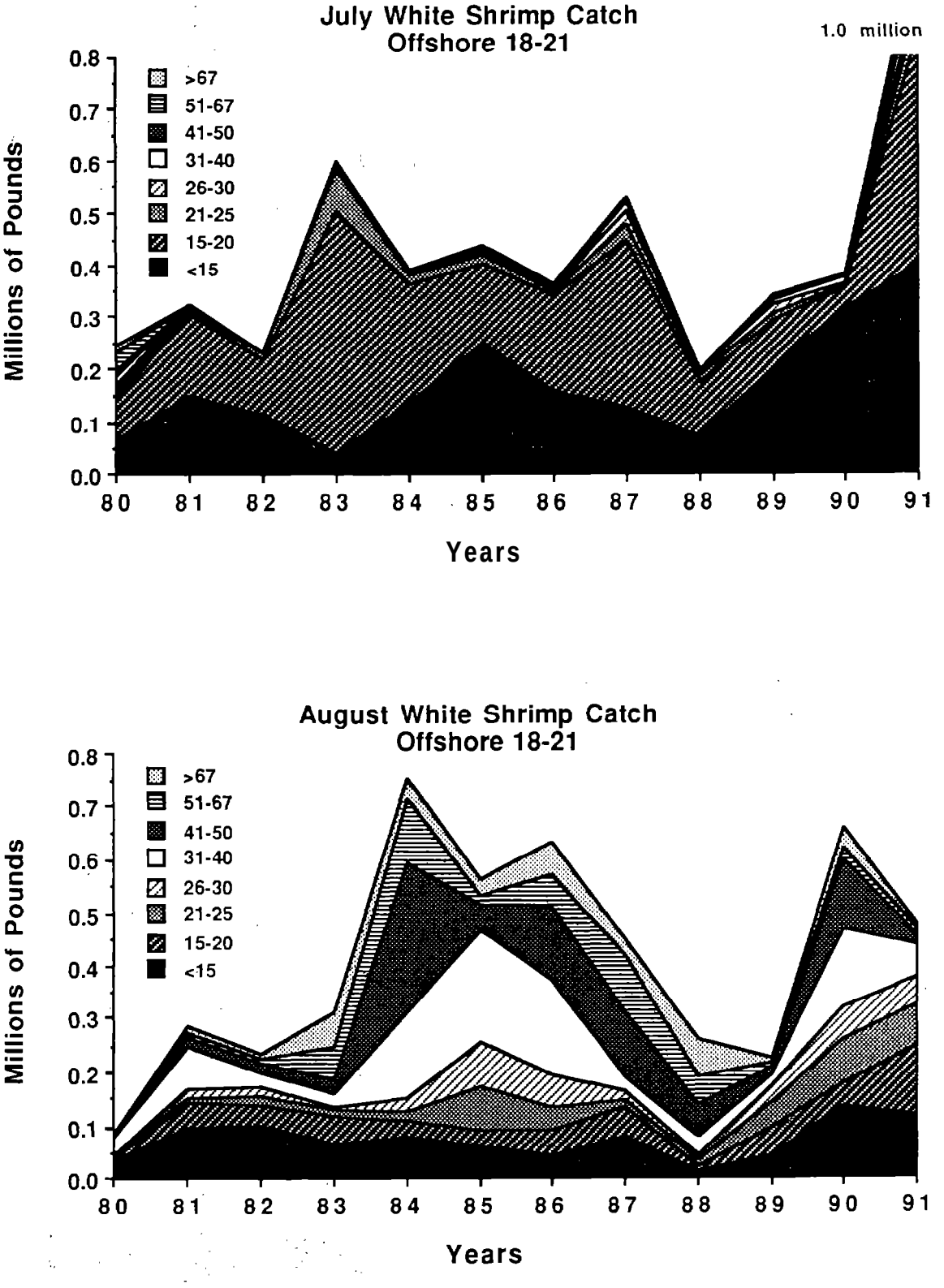


Figure 9. White shrimp size distribution off the Texas coast from 1980-1991 during the July and August.